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# BASICS OF HEALTHY NUTRITION

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# Nutrition - introduction

- ▶ Healthy diet:
  - a) diet that maintains and strengthens human health, and has an beneficial effect on human growth and developement, well-being and productivity.
  - b) safe, nutritional and energy well-balanced, functional and biologically acceptable food – such diet is preventive (protective).
  
- ▶ Preventive diet includes mostly dishes made from whole grain cereals, fruits and vegetables. **Vegetable fats are preferred than animal fats???**
  
- ▶ In preventive nutrition should be as less fried foods and refined foods , especially simple sugars .

# Nutrition - introduction

- ▶ For growth, development and functioning adult organism requires 120 chemical substances that are obtained by the food and drink.
  
- ▶ Among these substances are:
  - a) Macronutrients : proteins, fats and carbohydrates
  - b) Micronutrients : vitamins and minerals
  - c) The essential fatty acids and amino acid
  - d) Fiber
  - e) Water
  - f) Various protective substances



# Nutrition - macronutrients: proteins and essential amino acids

## Proteins and amino acids

- Proteins are made up of chains of amino acids (at least 50, typically > 100)
- They are a vital nutrient
- The source of the energy (1 gram of protein = 4 kcal ) and amino acids needed to build the body.
- Average requirement of protein for an adult is 0.8 g/kg bw/day . 8 to 10% of the daily energy introduced .
- The upper limit for protein intake (in adults), that did not expect side effects is 2 g/kg bw/day (2.5 - times the recommended daily allowance ( RDA = recommended dietary allowance )) .
- The protein in the food should have a high biological value , which means that they contain a sufficiently high proportion of the essential amino acids

## Nutrition - macronutrients : proteins and essential amino acids

- Amino acids are the organic acids consisting of an amino group ( -NH<sub>2</sub> ) and a carboxylic acid ( -COOH ), and chain specific to each AMK

### Groups:

- a) Essential: the organism can not synthesize them and are essential for the organism
- b) Conditionally essential: arginine, cysteine, glutamine, ornithine , proline, selenocystein, serine, tyrosine (normal organism synthesises them, in certain conditions they need to be ingested with food)
- c) Nonessential alanine, asparagine, aspartic acid, glutamic acid, glycine.

## Nutrition - macronutrients : proteins and essential amino acids

- ▶ The daily needs of essential amino acids for an adult in mg/kg BW/day :

| Amino acid                  | Children (10-12y.o.) | Adults  |
|-----------------------------|----------------------|---------|
| Histidine                   | ???                  | 8 do 12 |
| Isoleucine                  | 28                   | 10      |
| Leucine                     | 42                   | 14      |
| Lysine                      | 44                   | 12      |
| Methionine +<br>cysteine    | 22                   | 13      |
| Phenylalanine +<br>tyrosine | 22                   | 14      |
| Threonine                   | 28                   | 7       |
| Tryptophan                  | 3,3                  | 3,5     |
| Valin                       | 25                   | 10      |
| Total                       | 214                  | 84      |

## NUTRITION - macronutrients : fat and essential fatty acids

- Fats are necessary in the diet due to :
  - a) The energy value of 1 gram of fat = 9.3 kcal
  - b) The provision of essential fatty acids
  - c) Absorption of fat soluble vitamins
  - d) The importance of the structure and metabolism of the organism
- A diet containing less than 20 % fat, is not tasty.
- In developed countries, fats contributes to 45% of all daily 's energy value of the diet.

# NUTRITION - macronutrients : fat and essential fatty acids

- Chemical classification: fats are esters of three fatty acids and the alcohol glycerol.
- Types
  - a) Saturated fats (mainly animal products) do not have double bonds between carbons in chains - 22 essential fatty acids ( formic, octene , butter, margarina ... ) .
  - b) Unsaturated fats: they have one or more carbon bonds - oleic, linolana, linoleic acid and arachidonic acid. They are divided into polyunsaturated (margarine, sunflower oil) and monounsaturated (olive oil).
- Saturation is important, because its effects related to cholesterol – polyunsaturated are lowering all of its forms, monounsaturated only harmful forms (total cholesterol and HDL )
- Essential fatty acids: the organism can not synthesize them.
- They are divided into family linoleic (omega - 6) and linolenic (omega - 3) acids



## NUTRITION - macronutrients : fat and essential fatty acids

- Omega - 3 fatty acids: fish, vegetables (lettuce, cabbage, onions)
- Omega - 6 fatty acids: sunflower, soybean and corn oil; vegetable margarine .
- Conjugated linoleic acid (polyunsaturated): milk, cheese and butter .
- Saturated fatty acids:
  - a) animal source (butter, beef, eggs, cheese),
  - b) plant source ( cocoa , cocoa butter , chocolate ) .
- Hard fats: baked potatoes, chips, desserts (cookies), in certain margarines and fats for frying .
- A healthy diet includes all forms of fats other than hard fat (increased risk of cardiovascular events and various forms of cancer).
- **Natural fats are not bad, bad are industrially produced!!!**

## NUTRITION - macronutrients : carbohydrates

- Carbohydrates are chemical compounds that contain oxygen, hydrogen and carbon atoms.
- They do not belong to the essential components of the diet, as may occur in the process of gluconeogenesis from other nutrients (in the absence of carbohydrate, the amino acids are spent for gluconeogenesis and therefore reduces protein synthesis and accelerating the degradation of proteins).
- 1 gram of carbohydrate = 4 kcal.
- Types:
  - a) Simple carbohydrates (monosaccharides) are the fastest to digest and provide the human body the most energy in short time. Also cause a rapid rise in insulin (glucose, fructose, galactose). In nature they are found in fruits.
  - b) Complex carbohydrates: disaccharides (sucrose, lactose), oligosaccharides (sugar from sugar beet or cane) and polysaccharides (starch, cellulose).
- Role in body: for creating muscle glycogen (muscle and liver by about 400 grams); a basic nutrient for the nervous system (brain needs to 2/3 of the sugar from the blood).
- They accumulate in the liver and muscles, while the surplus accumulates in the body as fat.

## NUTRITION - macronutrients : carbohydrates

- WHO recommendations: the proportion of carbohydrates in the daily diet of an adult should constitute no more than 60% of the daily intake of energy - from 5 to 15 % percent of the carbohydrates can be in the form of mono- and disaccharides , in particular from fruit, vegetables and dairy .
- Most of the daily energy introduced in the form of carbohydrates should be with complex sugars - polysaccharides (they can be found in unprocessed vegetable sources , eg . Wholegrain cereal products , in legumes , fruits and vegetables).
- Glycemic index: the ratio between the increase of glucose in the blood (expressed as area under the curve of blood glucose 2 hours after a meal ) after ingestion of 50 grams of selected carbohydrates and 50 grams of glucose in the same person .
- Eating food with high glycemic index is a risk factor for diabetes , obesity and other metabolic disorders.

# NUTRITION - macronutrients : carbohydrates

| Glycemic index | Carbohydrate food                                |
|----------------|--|
| 100%           | Glucose  |
| 80 – 90%       | Corn flakes, carrots, potatoes, honey            |
| 70 – 79%       | Graham bread, millet, husked rice                |
| 60 – 69%       | White bread, paddy rice, bananas, raisins        |
| 50 – 59%       | Buckwheat porridge, white pasta, bran, oat cakes |
| 40 – 49%       | Sweet potatoes, beans, peas, oranges (and juice) |
| 30 – 39%       | Green beans, apples, cream, milk, yoghurt        |
| 20 – 29%       | Lentils, fructose                                |
| 10 – 19%       | Soybeans, walnuts, hazelnuts, peanuts            |

- ▶ Certain amount of carbohydrates that you consume in one meal, can greatly increase the concentration of insulin and glucose in the blood, but if the same amount is evenly spread throughout the day, glucose and insulin does not rise equally strong .

## Nutrition - macronutrients: fibers

- Dietary fiber or roughage : plant polysaccharides by man with its digestive enzymes can not digest ( some of them are decomposed by bacteria in a wide intestine ) .
- Types:
  - a) soluble - pectins , gums, mucilage, some hemicellulose
  - b) Insoluble - cellulose, lignin, and some hemicelluloses.
- Fibers are present in particular in fruits, vegetables, cereals, legumes and various seeds.
- A diet low in fiber is associated with constipation, diverticular disease, diabetes, heart and vascular diseases, hypertension, obesity and the development of irritable bowel syndrome, colon cancer , duodenal ulcer and gallstones .
- Excessive consumption of dietary fiber: diarrhea, flatulence, intestinal obstruction and lack of certain mineral substances .
- Protective diet should contain up to 50 grams of dietary fiber in adult per day.

## Nutrition - macronutrients: fibers

| Food   | The amount of dietary fiber/100g |
|--|----------------------------------|
| Wholemeal bread                                | 8,5                              |
| Black bread                                    | 5,1                              |
| White bread                                    | 2,7                              |
| Potatoes (and other tuber and root vegetables) | 1 – 2,5                          |
| Leafy vegetables                               | 2,5 – 3,5                        |
| Fruits   | 3                                |
| Pulses   | 4,3 – 6,9                        |

# Nutrition - macronutrients: fibers

- Effects of dietary fiber:
  - a) Insoluble fiber: increase the amount of sludge, increase the amount of water in the stool, soften stools, increase the frequency of bowel movements, speed up the passage of intestinal contents (thereby reducing the exposure time of the intestinal walls of toxic and carcinogenic substances), - increasing the volume of sludge and faster passage of intestinal contents protect the intestinal wall .
  - b) Soluble fibers: their products are short chain fatty acids (an octenyl, propionic, butyric), and lactic acid. In the liver, they prevent the formation of cholesterol, reduce the acidity of the mud – in that way they relieve the metabolism (as less uric acid is produced from ammonia in liver). Their fermentation products (butyrate and propionate) are an source of energy for the intestinal cells, they affect their differentiation and protect against the formation of polyps, inflammation and cancer
  - c) Promote the secretion of intestinal mucus.
  - d) They have non-specific binding capacity of different substances - can affect the metabolism of minerals, trace elements and fat-soluble substances, bile acids, fat, cholesterol, bind carcinogens, slowing down the absorption of sugars and fats, etc.
- Prebiotics: dietary fibers, which have a selective effect on the intestinal flora.
- Adding of prebiotics in diet increases the number and activity of probiotics (npr.laktobacillus) in the intestine and reduces the number and function of pathogenic bacteria.
- In a normal diet with plenty of fruit and vegetables and whole grain cereal products, daily addition of prebiotics in the diet is not required.

# Nutrition - Micronutrients

- Vitamins and minerals
- Substances that are absolutely necessary for a healthy life.
- In the food they are in small amounts.
- Reference values of the recommended intake of these substances are known.
- Reference values do not take into account:
  - a) The needs of patients,
  - b) Rekonvalescent needs,
  - c) Needs for diseases that arise as a result of too small intake of micronutrients
  - d) Do not apply to people with digestive and metabolic disorders, for drug addicts and people regularly taking medication.
- It is necessary to establish an individual determination lack.
- Excessive intake can be harmful only when exceeds the reference value several times.



## Nutrition - micronutrients: vitamins

- Types:
  - a) fat-soluble : A, D, E, K ,
  - b) soluble in water: C, B group.
- Lack of vitamins causes the disease (avitaminosis, hypovitaminosis): skin and mucous membranes are particularly sensitive.
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- Poisoning with large doses of vitamins (hypervitaminosis - especially vitamins A, D, K and niacin.

# Nutrition - micronutrients: vitamins

## Vitamin A (retinol)

- Chemically it is an isoprenoid lipid, which is related to caroten, acting as a provitamin (organism can synthesize vitamin A in the intestinal mucosa and the liver from carotene).
- There are two chemically closely related compounds: vitamin A<sub>1</sub> and A<sub>2</sub>. Aldehydes of vitamin A are an ingredient in the visual pigment - this is the only well-known function of vitamin A.
- It affects many processes in the body: growth, synthesis of polysaccharides, the stability of cell membranes ....
- A vitamin deficiency: night blindness, dry skin, dry mucous membranes of the eye ...
- Lack of vitamin A: food with a little milk, butter, fresh vegetables, low-fat, with lots of unsaturated fatty acids, low in vitamins E and C.
- Recommended daily intake: 0.6 mg/day (for women 10-20% less).
- Nutritional source: liver, vegetables with a high content of beta-carotene (carrots, spinach, kale).
- Poisoning in vitamin A are very rare and are caused by chronic consumption of large amounts of vitamin A (minimum toxic dose for adults is 75,000 to 100,000 IE every day for 6 months, or 40,000 units every day for 8 years)
- Symptoms: weight loss, anorexia, dry and cracked skin, hair loss, brittle nails, inflammation of the gums and lips, hypercalcemia, enlarged liver and spleen, anemia, bone callosity.

# Nutrition - micronutrients: vitamins

## Vitamin D (calcitriol)

- Vitamin D<sub>3</sub> (cholecalciferol) is the fat-soluble vitamin that (unlike other vitamins) may also be formed in the human body, in the skin under the influence of ultraviolet B rays of sunlight.
- Plants form vitamin D<sub>2</sub> (ergocalciferol) - has the same effects as vitamin D<sub>3</sub>.
- Vitamin D<sub>3</sub> is metabolized in the liver in vitamin 25 (OH) D<sub>3</sub>, which is the major form of vitamin D in the bloodstream.
- 25 (OH) D<sub>3</sub> in the kidneys and other tissues (macrophages, prostate, breast, intestine, etc.) is metabolised to calcitriol, which is the active form of the vitamin D, or hormone D.
- It is one of the few vitamins that we do not get enough with a balanced healthy diet.
- Vitamin D has an effect on calcium metabolism in muscles, regulation of the cell cycle, immune system, insulin secretion, etc.
- Vitamin D deficiency: rickets, increased risk of falls and fractures, reduction of muscle mass and strength, muscle aches, increase the risk of cancer, type 2 diabetes, cardiovascular disease ...
- With normal healthy diet we get 100 IU of vitamin D / day (10% of daily needs).
- Hypervitaminosis D - in patients taking the active forms of vitamin D: calcium increase.

# Nutrition - micronutrients: vitamins

## Vitamin E ( tocopherol )

- ▶ Types: alpha -tocopherol , beta, gamma and delta (efficiency is different in a ratio of 100: 50: 25: 1)
- ▶ The need for vitamin E depends on the amount of polyunsaturated fatty acids in the daily diet - deficiency is very rare, because mixed diet contains enough vitamin E.
- ▶ Good sources of alpha tocopherol: wheat germ , sunflower oil, corn germ oil, rapeseed oil
- ▶ Tocopherol Beta: wheat germ ,
- ▶ Gamma tocopherol: Corn and soybean oil ,
- ▶ Delta- tocopherol: soybean oil .
- ▶ Hypovitaminosis: muscle weakness , increased excretion of creatine from urine ( due to accelerated muscle protein metabolism ), balance disorder , disturbance, nausea, fatigue, high blood pressure and palpitations (a feeling of irregular, rapid and strong heart beat).

## Nutrition - micronutrients: vitamins

### Vitamin K (naphthoquinone)

- ▶ Under this name we combine a whole range of compounds: menadione (vitamin K<sub>3</sub>), which does not exist in nature, phylloquinone (vegetable vitamin, vitamin K<sub>1</sub>), menaquinone (bacterial vitamin, vitamin K<sub>2</sub>).
- ▶ It is not known how much vitamin K daily human needs.
- ▶ In our body it is produced by bacteria that are part of the normal intestinal flora.
- ▶ Good sources: green vegetables, dairy products, meat, eggs, cereals.
- ▶ Hypervitaminosis: especially in premature born babies.
- ▶ Hypovitaminosis: impaired absorption of fat.


## Nutrition - micronutrients: vitamins

### Vitamin B<sub>1</sub> (thiamine diphosphate)

- ▶ An important enzyme in certain processes in the body.
- ▶ Lack causes the disease beriberi: early signs of hypovitaminosis are muscle spasms, anorexia, paresthesia and pain in the calves.
- ▶ Later they develop polyneuritis, paralysis of limbs, heart failure, tachycardia, shortness of breath and edema.
- ▶ A diet rich in carbohydrates and fat can cause vitamin B<sub>1</sub> hypovitaminosis, especially among larger effort and sweating.
- ▶ Poisoning: not known .
- ▶ Good food sources of vitamin B<sub>1</sub>: meat (especially pork), sole, tuna, whole grains, oatmeal, legumes and potatoes .

# Nutrition - micronutrients: vitamins

## Vitamin B<sub>2</sub> (riboflavin)

- ▶ An important coenzyme in the enzyme system of the respiratory chain .
  - ▶ Increased need: alcoholics, smokers and long term usage of contraceptive pills .
  - ▶ Early signs of deficiency: pale lips, inflammation of lips, conjunctivitis, photophobia , malaise, muscle weakness , weight loss .
  - ▶ Late signs of deficiency: inflammation of the lips and mouth corners , glossitis, edema, anemia , dysphagia , corneal vascularization and seborrheic dermatitis .
  - ▶ Good food source: dairy products, milk, meat, fish, eggs, whole grain products.
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# Nutrition - micronutrients: vitamins

## Vitamin B<sub>3</sub> (niacin)

- ▶ Two forms: nicotinic acid, nicotinic acid amide (in the body they are transforming from one to another).
- ▶ Important in certain processes in the body .
- ▶ Lack occurs in a one-sided diet that contains a lot of maize and millet , and has little biological value (pellagra disease ).
- ▶ Early signs of deficiency : inflammation and rough skin (especially on the exposed parts), inflammation and hypertrophy of papillae of tongue.
- ▶ Later: diarrhea, abdominal distension, purple tongue with atrophied papillae, stomatitis, depression and mental dullness (3D syndrome - depression, diarrhea, dermatitis).
- ▶ Intoxication: hyperemia of skin, dizziness.
- ▶ Good food sources: meat, fish, milk, eggs, cereals, potatoes.
- ▶ In the body, it is synthesized from the amino acid tryptophan in the liver and kidneys .



## Nutrition - micronutrients: vitamins

### Vitamin B5 (pantothenic acid)

- ▶ Important in the processes of fatty acid synthesis.
- ▶ Lack: symptoms of the disease beriberi and pelagra (burning feet syndrome ???).
- ▶ Good food sources: milk, meat, liver, fish, wholegrain cereals, legumes.

## Nutrition - micronutrients: vitamins

### Vitamin B6 (pyridoxine)

- ▶ It includes pyridoxine, pyridoxamine and pyridoxal, and their esters of phosphoric acid.
- ▶ Important in the metabolism of amino acids ( "Power Vitamin").
- ▶ Lack (larger requirements): when taking contraceptive pills, before menstruation, high blood sugar during pregnancy, the high protein diets, drinkers of alcoholic beverages, smoking and when taking certain medications.
- ▶ Lack of vitamin B6 may be due to a lack of folic acid and vitamin C, A, E and B12.
- ▶ Lack causes anemia, slows growth, causes damage to the skin, inflammation of the mouth and lips, and peripheral neuropathy or seizures in children).
- ▶ Poisoning: not known.
- ▶ Good food sources: meat (especially pork), poultry, fish, cabbage, green beans, lentils, lettuce, potatoes, bananas and whole grain cereal products.

## Nutrition - micronutrients: vitamins

### Vitamin B7 ( biotin )

- ▶ Lack: changes in the skin, hair, glands, nerves , bone marrow, gonads . It can cause diarrhea, loss of appetite , fatigue, depression and nausea .
- ▶ There are frequent muscle aches, and loss of reflexes, tongue becomes pale and smooth, skin inflammation occurs; anemia, hair loss, lower cholesterol.
- ▶ Lack occurs with prolonged consumption of raw eggs (irreversibly binds to avidin).
- ▶ Increased needs: with antibiotic therapy , nutrition of children with milk powder and during stressful conditions.
- ▶ Good food sources: liver, soybeans, eggs , nuts , oatmeal , spinach , mushrooms , lentils .

## Nutrition - micronutrients: vitamins

### Vitamin B<sub>9</sub> (folic acid, folate)

- ▶ Comparison of active compounds in the customary diet: 1 mcg of folate equivalent = 1 mcg dietary folate = 0.5 mcg of synthetic folic acid.
- ▶ Important in the prevention of neural tube defects .
- ▶ Good food sources: leafy vegetables, tomatoes, cucumbers, cabbage, spinach, brussels sprouts , oranges , grapes , whole-grain cereals , potatoes , soybeans , milk, eggs and cheese .

# Nutrition - micronutrients: vitamins

## Vitamin B<sub>12</sub> (cobalamin )

- ▶ Lack causes anemia .
- ▶ The deficiency occurs in the vegan diet that does not contain meat, milk and eggs .

## Vitamin C (ascorbic acid )

- ▶ It is derived from carbohydrate .
- ▶ Biochemical falls within Redox systems involved in the synthesis of collagen .
- ▶ Lack: scurvy.
- ▶ Early signs : bleeding gums .
- ▶ Later : muscle pain , swollen joints , damage to the capillaries and bleeding , loosening and loss of teeth , poor wound healing , changes in bone ( epiphysis )
  
- ▶ Good food sources : fruits, vegetables , citrus fruits , peppers , broccoli , blackberries , gooseberries , potatoes, cabbage , spinach , tomatoes - the long-term warming destroys almost all vitamin !

## Nutrition - micronutrients: vitamins

| Vitamin         | RDA                   | Food source   |
|-----------------|-----------------------|---|
| Vitamin A       | M: 5000 IE, F: 4000IE | Milk, butter, oil, apricots, leafy vegetables                         |
| Vitamin B1      | 1,2 do 1,4 mg         | Ground cereals, meat, yeast, legumes                                  |
| Vitamin B2      | 1,1 do 1,8 mg         | Milk, meat, eggs, ground grain, yeast                                 |
| Niacin          | 13 do 20 mg           | Cereals, liver, yeast, meat   |
| Vitamin B6      | 2 mg                  | Bananas, ground grain, poultry, legumes, leafy vegetables .....       |
| Vitamin B12     | 3 mcg                 | Food of animal origin   |
| Panhotenic acid | 5 do 10 mg            | Milk, eggs, citrus fruits, meat, potatoes, ground grain               |
| Folic acid      | 400 mcg               | Leafy vegetables, offal, dried beans, wheat germ                      |
| Vitamin C       | 45 mg                 | Citrus fruits, tomatoes, red pepper, green pepper, melon, pomegranate |
| Vitamin D       | 1 000 IE              | Meat, margarine, fish oil, saltwater fish, liver, egg yolk            |
| Vitamin E       | 12 do 15 IE           | Vegetable oils, margarine, ground cereals, nuts                       |

# Nutrition - micronutrients: minerals

- ▶ Anorganic essential nutrients
  - a) Macroelements: sodium, chlorine, potassium, calcium, phosphorus, magnesium and sulfur .
  - b) Micronutrients: iron, iodine, fluorine, zinc, selenium , copper, manganese, chromium, molybdenum, cobalt and nickel .
  
- ▶ Macroelements: we need more than 50 mg/day.
- ▶ Microelements: we need less than 50 mg/day.
  
- ▶ If inorganic substances are consumed too much , they can cause poisoning.

# Nutrition - micronutrients: minerals

## SODIUM

- ▶ Important because of their role in the homeostasis of blood volume, the formation of nerve impulses, muscle contraction and acid-base balance.
- ▶ Lack: dehydration, dizziness, coma, muscle cramps, nausea, vomiting and loss of appetite.
- ▶ Hyponatremia: elevated blood pressure, nausea .
- ▶ Good food sources: salt, meat, fish, bread and canned vegetables.



# Nutrition - micronutrients: minerals

## Chlorin

- ▶ Important because of its role in the transmission of nerve impulses .
- ▶ It is part of stomach acid (digestion of stomach contents).
- ▶ Lack: cramps.
- ▶ Hiperchloremia: high blood pressure (with excessive sodium).
- ▶ Good food sources: meat, fish, bread, canned vegetables, cooking salt, beans and milk.

# Nutrition - micronutrients: minerals

## POTASSIUM

- ▶ Important because of its role in maintaining of cell membrane potential in generating nerve impulses, muscle contraction and electrolyte balance.
- ▶ Lack: muscle cramps, apathy, loss of appetite and irregular heartbeat.
- ▶ Hyperkalemia: cardiac arrhythmias.
- ▶ Good food sources: meat, fish, milk, yogurt, fruit, vegetables and bread.

# Nutrition - micronutrients: minerals

## CALCIUM

- ▶ Important because of its role in the growth and stabilization of solid tissues (bones and teeth), it is important for muscle contraction, maintaining the cell membrane potential, the transmission of nerve impulses, and the regulation of enzyme activity .
- ▶ Lack: osteopenia, osteoporosis, impaired muscle contractions and muscle spasms.
- ▶ Excessive intake: reduces the absorption of trace metal, cardiac arrhythmias, constipation, kidney stones and calcification of soft tissues.
- ▶ Good food sources: milk and dairy products, egg yolks, beans, peas, dark - green vegetables and cauliflower.

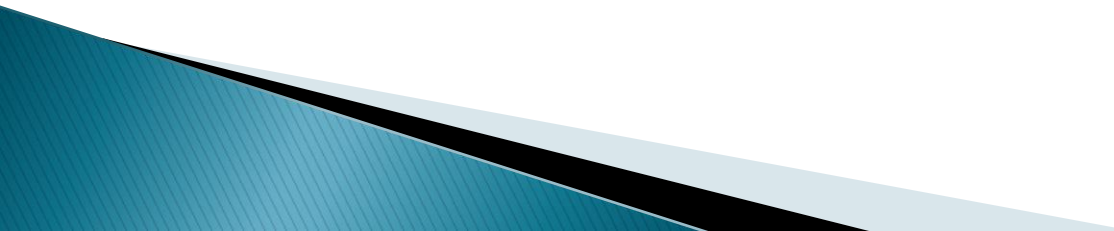
# Nutrition - micronutrients: minerals

## MAGNESIUM

- ▶ Significant: in the synthesis of proteins, fats, nucleic acids, and the muscular contraction, the component of bones and teeth .
- ▶ Lack: the weakened muscles, tiredness, listlessness, tremors and muscle spasms, cardiac arrhythmias (one of the most dangerous).
- ▶ Excessive intake: nausea, vomiting , diarrhea .
- ▶ Good food sources: seafood, nuts, green leafy vegetables, fruits, whole grain products, milk and yogurt .

# Nutrition - micronutrients: minerals

## SULPHUR

- ▶ It is important because of its role in maintaining of acid - base balance .
  - ▶ The consequences of the lack are unknown.
  - ▶ Excessive intakes: unknown .
  - ▶ Good food source eggs, cheese, seafood and meat .
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# Nutrition - micronutrients: minerals

## IRON

- ▶ It is important because of its role in oxygen transport (hemoglobin and myoglobin), and also participates in immune functions.
- ▶ Lack: anemia, fatigue and infections .
- ▶ Excessive intake: damages DNA and protein in the cells and increases risk of cardiovascular disease .
- ▶ Good food sources: liver, kidney, eggs, red meat, seafood, oysters, bread, flour, molasses (sugar syrup), dried legumes, nuts, green leafy vegetables, broccoli, figs, raisins and cocoa .

# Nutrition - micronutrients: minerals

## ZINC

- ▶ Important because of its role as a component of metalenzymes, participates in the synthesis of proteins and maintaining immune function, restoring the tissue, metabolism of nutrients, but it also has antioxidant activity .
- ▶ Lack: poor growth, slow healing, worsening of infectious conditions and anorexia.
- ▶ Excessive intake: deterioration in the absorption of iron and copper, an increase in HDL/ DL cholesterol, anemia, nausea, vomiting and impaired immune system.
- ▶ Food source: oysters, shellfish (clams, snails, crabs ), beef, liver, poultry, dairy products, whole grain products, vegetables, asparagus and spinach .
- ▶ iodine, fluorine, selenium, copper, manganese, chromium, molybdenum, cobalt and nickel - cofactors of enzymes, antioxidants, metabolism of thyroid ... ..

## Nutrition - micronutrients: minerals

| Mineral                             | RDA  | Food source   |
|-------------------------------------|--|---|
| Calcium                             | Adults: 0,8 g                                | Milk and dairy products, leafy vegetables   |
| Phosphorus                          | Adults: 0,8 g                                | Milk, full of ground cereals, cheese, legumes, eggs, meat, nuts, liver, peanut butter |
| Iron                                | M: 10mg, F: 18mg                             | Liver, meat, legumes, full of ground cereals, potatoes, egg yolk ....                 |
| Sodium                              | 2.5 do 7 g                                   | Salt, seafood, milk, vegetables, meat   |
| Copper                              | 1 do 2 mg                                    | Liver, egg yolk, almonds, legumes, full of ground corn, oat flakes                    |
| Magnesium                           | 300 do 450 mg                                | Bananas, fully milled cereals, pulses, milk, nuts, green leafy vegetables             |
| Iodine                              | 100 do 150 mcg                               | Iodized salt, seafood   |
| chlorine,<br>sulfur                 | 0.5 g,<br>Enough in food with enough protein | Salt, meat, sea food,<br>Meat, fish, eggs, milk                                       |
| Zink                                | 15 mg  | In all foods  |
| Potassium                           | 2 do 6 g                                     | Meat, cereals, vegetables, legumes, fruits  |
| Trace elements (Co, Cr, Mn, Mo, Se) |  | Leafy vegetables, full of ground cereals, fruits, legumes, meat ....                  |